





Western Norway University of Applied Sciences





SFI Smart Ocean

A Research-based Innovation Centre for Ocean Technologies

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"Temamøte: Norsk Havobservasjons-laboratorium", GCE Ocean Technology, Vil Vite Bergen Vitensenter 2020-02-19

SFI Smart Ocean

Flexible and cost-effective monitoring for management of a productive and healthy ocean



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CONTENTS

- Industrial & societal challenges; Knowledge needs
- The SFI Smart Ocean initiative





OECD: The Ocean Economy in 2030

- "The ocean industries have the potential to double their contribution to the global economy by 2030"
- Norwegian industries World leaders in Ocean industry, Technology, and Operations:
 - Oil & Gas
 - Aquaculture
 - Offshore wind

• Unique possibility for Norwegian industry:

- Further develop Norway as a key ocean technology provider
- Increased innovation and further international growth









VGED

OECD: The Ocean Economy in 2030

Emphasis:

- Measurement
- "The drive for miniaturization and automation, the growing demand for low-power, low-cost devices for the measurement and graphic display of the physical environment, and moves to endow the sensor itself with intelligence"



OECD

The Ocean Economy in 2030

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JPI Oceans – Strategic Research and Innovation Agenda 2015-2020 (EU supported)

 "Strengthening observation and monitoring capacities through enabling technologies, new platforms and sensors,

addressing **under-sampling** and ensuring that new **environmental parameters can be rapidly and accurately measured**"



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UN Decade of Ocean Science for Sustainable Development (2021-2030)

Objectives

- Generate the scientific knowledge and underpinning infrastructures and partnerships needed for sustainable development of the ocean.
- Provide ocean science, data and information to inform policies for a well-functioning ocean in support of all sustainable development goals of 2030 Agenda.







National strategies

- Regjeringens havstrategi
- HAV21
- MARITIM21
- Digital21
- OG21

Digitalization

Monitoring

Decision support

Data quality & security

Autonomous sensor technology

Continuous measurements

Big data management & analysis



Ny vekst, stolt historie

Regieringens havstrateg







SFI Smart Ocean - Application



Consortium

UNIVERSITY OF BERGEN



RESEARCH PARTNERS:

- University of Bergen (UiB) [project owner]
- Western Norway University of Applied Sciences (HVL)
- NORCE
- Norwegian Defence Research Establishment (FFI)
- Institute of Marine Research (IMR)
- Nansen Environmental and Remote Sensing Centre (NERSC)

USER PARTNERS - INDUSTRY CLUSTERS:

- GCE Ocean Technology
- GCE NODE Service AS

COOPERATION:

- VIS [formerly Bergen Technology Transfer (BTO)]
- Norwegian catapults and infrastructure

USER PARTNERS – INDUSTRY:

- NN1 International O&G operator
- NN2 International O&G operator
- Aker Solutions AS
- Kongsberg Maritime AS
- Xylem / Aanderaa Data Instruments AS
- Octio Environmental AS
- Tampnet AS
- Halfwave Subsea AS
- Metas AS
- Bouvet AS

USER PARTNERS – PUBLIC

National (regulating) authorities:

- Directorate of Fisheries
- Petroleum Safety Authority Norway



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Prime objective:

Wireless distributed network system of autonomous smart sensors

for multi-parameter monitoring

of

underwater environments and installations



SFI Smart Ocean - Key elements

SENSOR TECHNOLOGY / MEASUREMENTS:

- Autonomous & Intellingent sensors
- Rechargeable battery operation
- Low power (local "intelligence")
- Acoustic modem interfacing
- Robustness & Accuracy
- Anti-biofouling surfaces
- Data safety
- Cost-efficiency

MEASUREMENT STRATEGIES:

- Flexibility (size, location)
- Stationary platforms / No cabling
- Retrofit
- Adaptive sampling
- Time series / history
- Measurement strategies
- Uncertainty (requirements, sensor)



OVERALL OBJECTIVES:

- Sustainable ocean industry operations
- Fact-based ocean management

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COMMUNICATION

- Wireless sensor network
- Underwater (acoustic) & Air (5G, satelite)
- Standardized protocols (vendor invariant)
- Low power
- Reliability
- Cost-efficiency

SOFTWARE & DATA MANAGEMENT:

- Embedded data compression
- Two-way communication
- Local (embedded) "intelligence"
- Big-data handling
- Data storing / format
- Analysis / Machine learning / Prediction
- Data aggregation
- Data safety
- Reliability





Stakeholders and End users

- Oil and gas operators
- Offshore wind farm operators
- Aquaculture industry
- National (regulating) authorities:
 - Norwegian Environment Agency
 - Petroleum Safety Authority Norway
 - Norwegian Directorate of Fisheries
 - Norwegian Coast Guard
 - Kartverket
- Technology providers (manufacturers, vendors)



Oil & Gas: Monitoring

- Pipelines
- Subsea production systems
- Installations



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Offshore wind farming: Environment & Structures



Sheringham Shoal Offshore Wind Farm, UK (Equinor)



Integrated wind farm situation (Overview):

- Data/trend analyses / Machine learning / Prediction
- Sensor drift → Compensation methods



Aquaculture: Environment

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Dersom en skal kunne få pålitelig kunnskap om status og endringer i havets "helsetilstand", lokalt og globalt,

så må en ha

målinger av kritiske oseanografiske parametre, over tid, for havområder, kystområder, fjorder, havner og industrilanlegg.





Dersom olje- og gass - industrien skal kunne realisere sine visjoner om utslippsfrie autonome subsea produksjonsanlegg,

så må en ha et nettverk av stasjonære sensorer, på kritiske lokasjoner, som kan gi alarmsignal, før noe går galt.





Research partners: Scientists solving real challenges Examples of commercial products





Research partners: Scientists solving real challenges Examples of spin-off companies



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